Environment Canada

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Western and Northern Region

Région de l'Ouest et du Nord

Environmental Protection Service

Service de la protection de l'environnement

BEAUFORT SEA
1985 SHORELINE
DRIFT WASTE SURVEY

by

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W&NR-86/87-CP(EP)-13

ABSTRACT

Pre-Drilling Season and Post-Drilling Season Surveys were conducted in July and September, 1985, respectively, along the Beaufort Sea shoreline from Tent Point, Yukon, to Nuvorak Point, Northwest Territories to assess whether a waste cleanup program is warranted in 1987. The results of the two 1985 surveys indicated that over 90% of the drift wastes sighted along the Beaufort Sea shorelines had originated with the oil and gas industry.

The total number of waste sightings increased by 68% in the Post-Drilling Season Survey compared to the sightings in the Pre-Drilling Season Survey. This higher sighting frequency was attributed to industrial activity between survey dates. The frequency of waste sightings recorded during the two 1985 surveys was low relative to previous drift waste surveys. It is recommended that a follow-up shoreline drift waste survey be carried out during the 1987 summer drilling season to determine if a shoreline cleanup program should be conducted. It is also recommended that improved waste management practices be implemented by industrial operators and that provisions for cleanup be included in offshore Environmental Operating Conditions (EOC's) when necessary.

RÉSUMÉ

Des études ont été menées avant et après la période de forage, en juillet et septembre 1985 respectivement, le long du littoral de la mer de Beaufort depuis Tent Point (Yukon) jusqu'à Nuvorak Point (Territories du Nord-Ouest), afin de déterminer s'il y avait lieu d'entreprendre un programme d'enlèvement des déchets en 1987. Il ressort des résultats de ces deux études que plus de 90% des déchets aperçus à la dérive le long du littoral de la mer de Beaufort provenaient d'exploitations pétrolières et gazifères.

L'étude effectuée après la période de forage révèle une augmentation de 68% de nombre total de cas d'observation de déchets par rapport au nombre relevé au cours de l'étude avant la période de forage. Cette augmentation a été attribuée aux activités industrielles menées entre les études. On a aperçu peu de déchets pendant les deux études de 1985 par rapport aux études antérieures sur les déchets à la dérive. On conseillait toutefois de mener pendant la période de forage de l'été 1987 une étude sur les déchets à la dérive le long de la côte en vue de déterminer s'il fallait mettre en oeuvre un programme de nettoyage du littoral. Il était également recommandé que les industries améliorent leurs pratiques de gestion des déchets et, au besoin, que le programme de nettoyage soit inclus dans les conditions environnementales d'exploitation (CEE) au large des côtes.

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1. Introduction

Two surveys of drift wastes were carried out in 1985 along the Canadian Beaufort Sea coastline. The objectives of these surveys were to determine the quantity of drift wastes generated during an oil and gas open water drilling season, to assess whether a waste cleanup program is warranted in 1987, and to recommend appropriate disposal options.

The occurrence of marine debris such as persistent plastics throughout the oceans has been well-documented as a global pollution problem (Shiber, 1979; Shaw and Mapes, 1979; Merrell, 1980; Morris, 1980; Horsman, 1982; Wehle and Coleman, 1983; Bourne and Clark, 1984). The environmental impacts of these wastes have not been fully assessed, but they are known to have adverse effects on seabirds, marine mammals, and fish. Drift wastes also pose a potential threat to human safety in that they can foul vessel propulsion systems, and they may also cause negative aesthetic effects (Day, 1980; Dixon and Dixon, 1983; Connors and Smith, 1982; Furness, 1983; Bourne and Clarke, 1984; van Franeker, 1985; Furness, 1985; International Maritime Organization (IMO), 1985).

Studies have shown that marine life may be harmed by entanglement in, or ingestion of, persistent plastics and other synthetic materials. It was reported by van Franeker (1985) that approximately 80% of the North Sea fulmars (Fulmarus glacialis) sampled in the Netherlands had plastic in their gut, with each fulmar having an average of five fragments. Comparison of these recent data with figures given by Bourne (1976) suggests a sharp increase in plastic pollution in the North Sea in recent years. The consequences of ingesting plastics have usually been linked to digestive tract disorders which may lead to starvation (Day, 1980).

In the Canadian Arctic, the deliberate dumping of persistent plastic materials at sea is prohibited by the Ocean Dumping Control Act. The drift wastes that have been identified along the Canadian Beaufort Sea coastline (Wainwright and Fenton, 1983; Shearer et al., 1985) are considered to have been accidentally released, but the quantity and types of drift wastes that are present have warranted further investigation.

In 1974 and 1975, Wong et al. (1976) conducted surveys along the Beaufort Sea coastline to establish the baseline distribution of particulate pollutants, especially tar and plastics. Contamination of the beach areas by plastics,

particularly explosive cannister fragments originating from marine seismic activities, was prevalent. In 1975, some long stretches of beach that had been cleaned up during the 1974 survey were found to have been re-inundated with plastic wastes to the same level observed in 1974. The baseline level was approximately 0.1 - 0.2 g/m of shoreline.

Environmental Protection (EP), Yellowknife, N.W.T. conducted helicopter surveys in 1983 and 1984 to assess the accumulation of drift wastes along the southern Beaufort Sea coastline. Results of the surveys (Wainwright and Fenton, 1983; Shearer et al., 1985) indicated that the wastes observed would probably have minimal biological effects, but would have a negative aesthetic effect in areas which are otherwise not influenced by human presence. It was also concluded that the oil and gas industry was the major source of drift waste in the Canadian Beaufort Sea and that periodic cleanup of the shorelines, coupled with recovery and reuse of the materials, is the most practical and cost-effective waste management option available. As a result of these surveys, a waste cleanup program was conducted in 1984 by the two main oil and gas operators in the area, Dome Petroleum Limited and Esso Resources Canada Limited. The program involved collection of waste material by 3-4 labourers who walked along the shoreline from Tent Island in the Yukon to Nuvorak Point in the N.W.T. The results of a Post-cleanup Survey conducted by EP in 1984 (Shearer et al., 1985) indicated that the cleanup program was effective in removing the larger, more visible and/or valuable items while some of the smaller bits of debris were left behind.

As a follow-up to the 1983 and 1984 shoreline drift waste surveys, Pre- and Post-Drilling Season Surveys were carried out in late July and early September, 1985 in the area depicted in Figure 1. This report presents and discusses the results of the two 1985 surveys.

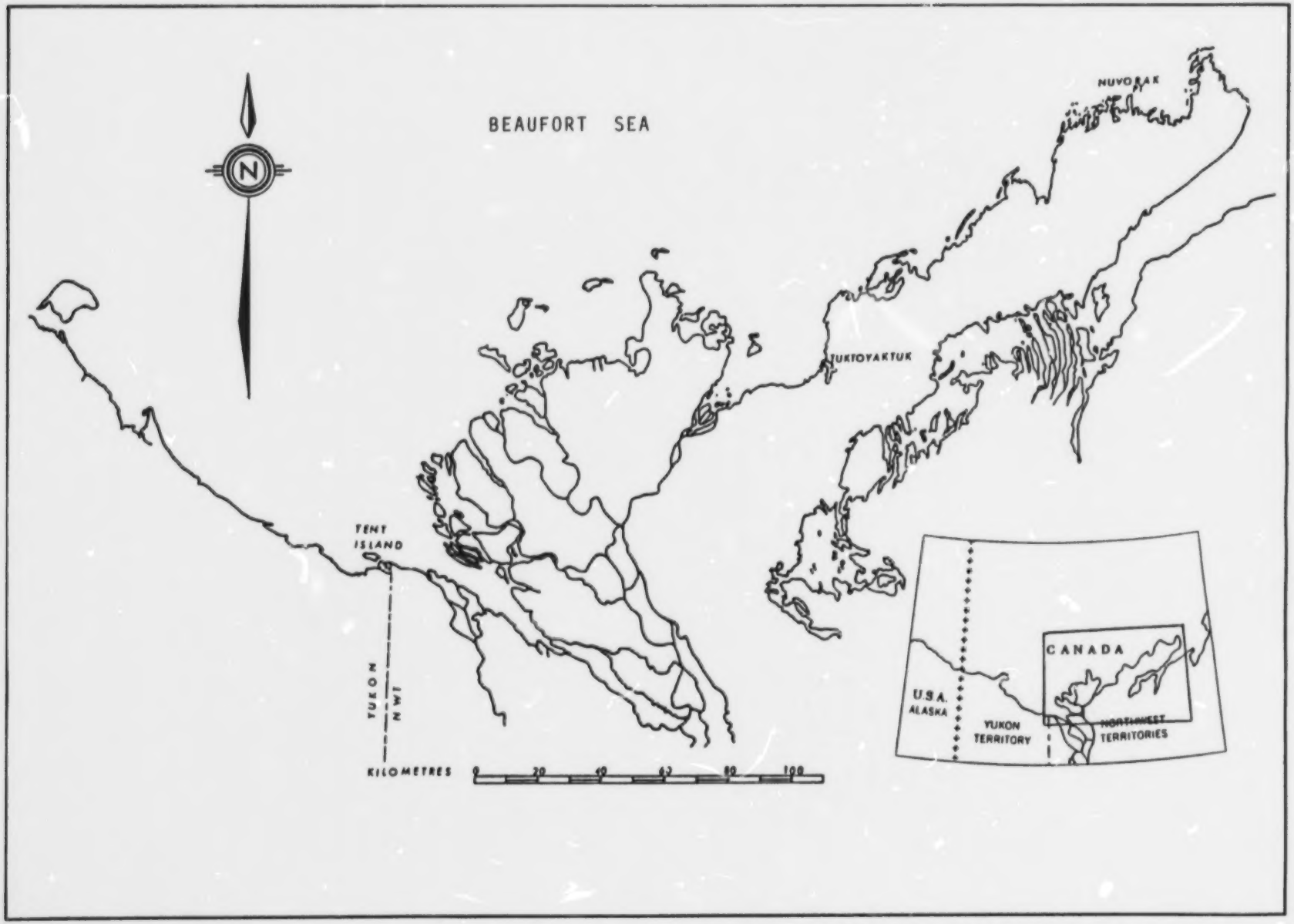

Figure: 1. MAP SHOWING THE LOCATION OF THE 1985 SURVEY AREA, TENT ISLAND, YUKON TO NUVORAK POINT, N.W.T.

2. Methods:

Two shoreline surveys were conducted on the Beaufort Sea coastline in July and September of 1985. Surveys were carried out along the shoreline depicted in Figure 1. Both surveys were divided into an Eastern Portion and a Western Portion. The center of operations was the Polar Continental Shelf Project base camp in Tuktoyaktuk. The Eastern Portion included the outermost exposed shoreline from Nuvorak Point to Flagpole Point (Figure 2). The Western Portion encompassed the shoreline between Tent Point (Tent Island, Yukon) and Peninsula Point and included all islands less than 2 kilometres offshore (ie. Hendrickson Island, Kendall Island, Garry Island, and Oliver Island) as depicted in Figure 3. The lower half of Shallow Bay and Kittigazuit Bay were not surveyed because it was believed that any drift waste found there would have originated from the Mackenzie River outflow and not from Beaufort Sea onshore drift.

A Pre-Drilling Season Survey was conducted on July 28-29, 1985 using a Bell 206B Jet Ranger II helicopter (C-GNVK) flying at speeds of 100 to 160 kilometres per hour at altitudes ranging from 15 to 60 metres. The Western Portion was conducted on July 28, 1985, between 1830 hr. and 2130 hr. and started at Peninsula Point and ended at Tent Point. The Eastern Portion was conducted on July 29, 1985, between 1930 hr. and 2330 hr. and started at Flagpole Point and ended at Nuvorak Point.

A Post-Drilling Survey was conducted on September 6-7, 1985. This survey was also carried out from a Bell 206B Jet Ranger II helicopter (C-GJKN) flying at the speeds and altitudes set in the Pre-Drilling Season Survey. The Eastern Portion of the survey was conducted on September 6, 1985, between 1945 hr. and 2220 hr. and involved flying to Nuvorak Point and then conducting the survey back to Flagpole Point. The Western Portion was carried out on September 7, 1985, between 1030 hr. and 1730 hr. The longer flight time was due to several landings at unscheduled destinations. In both surveys, the aircraft flew approximately 30 metres offshore to afford a clear view of the shoreline.

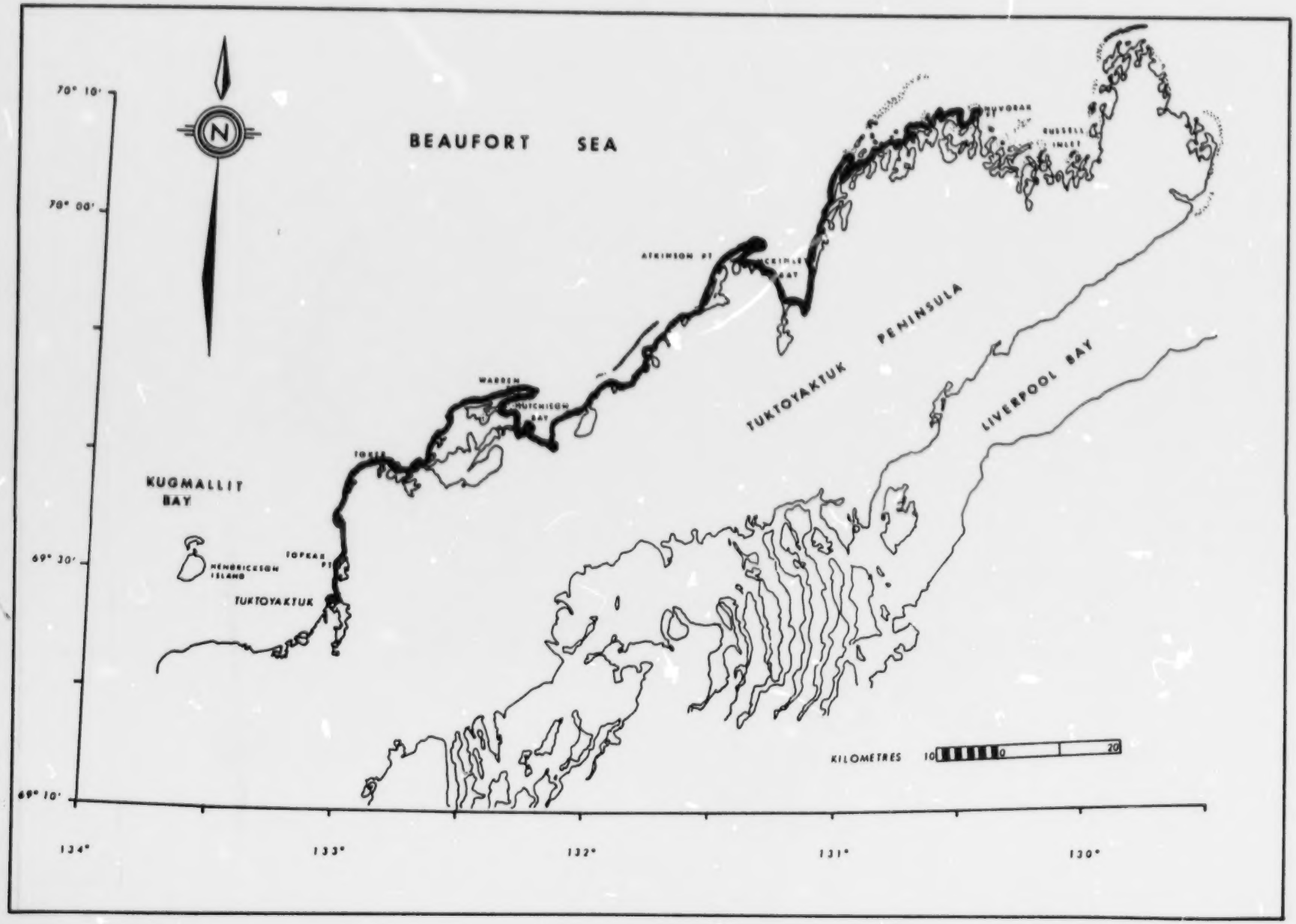

Figure 2: Map Showing Eastern Portion of 1985 Survey - Nuvorak Point to Flagpole Point.

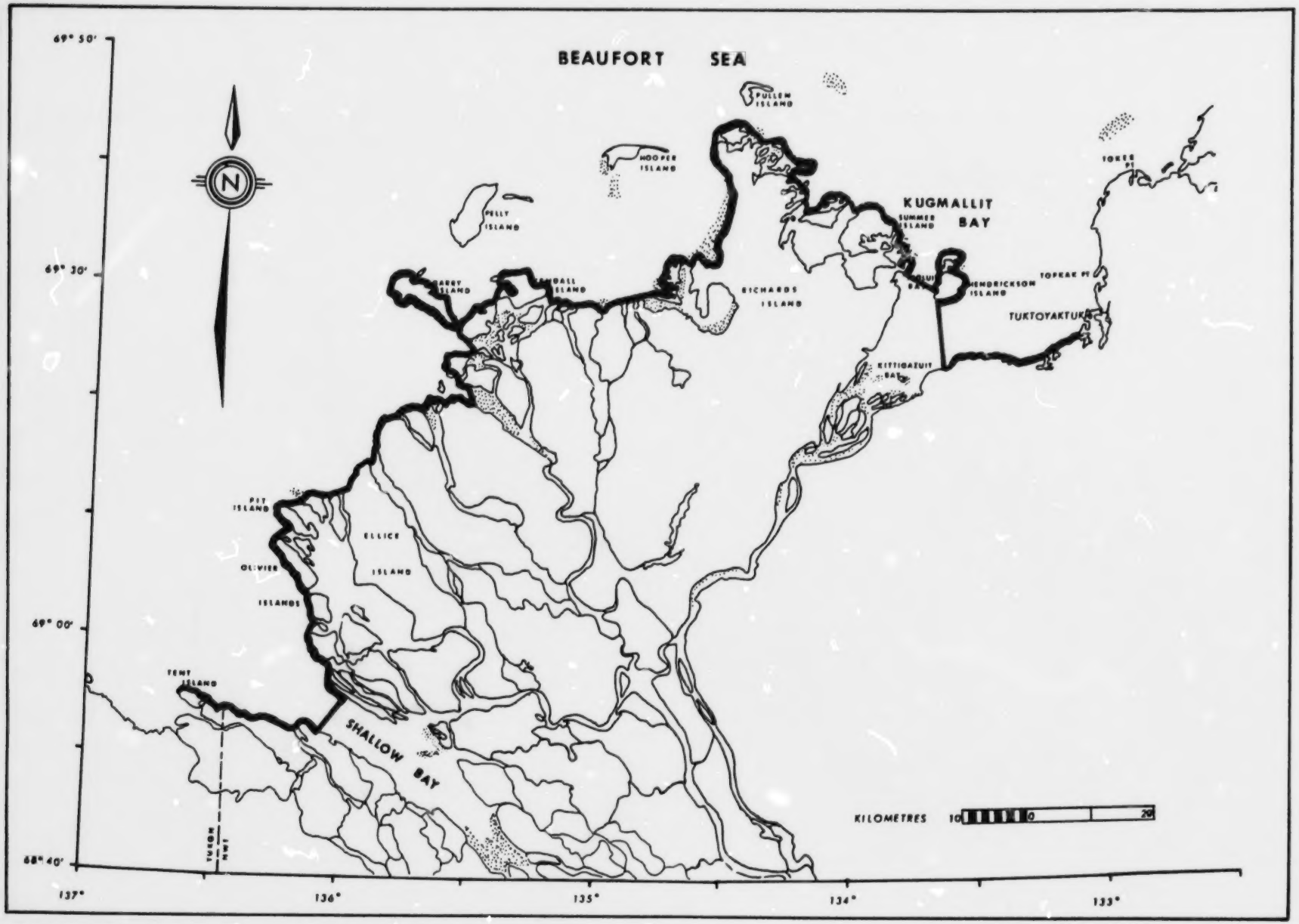

Figure 3: Map Showing Western Portion of 1985 Survey - Tent Island to Peninsula Point.

The survey team consisted of three people: the pilot and two observers. One observer was positioned in the front of the aircraft to obtain a clear view of the upcoming coastline, and the other in the rear, on the shoreline side of the aircraft. During the two surveys, objects were recorded on marine charts (scale of 1:50,000) at the time of sighting. Elapsed time from the starting point of the survey and position references were also recorded for all materials sighted. All waste materials reported were approximately one half square metre or greater in exposed surface area.

Only the materials which were presumed to have been cast onto the shoreline by wave action were counted. Waste materials which appeared to be remains of hunting or fishing camps, natural debris, and waste materials which were a substantial distance from shore were not counted. The waste material reported did not include gas cylinders or 205 litre metal fuel drums because they were too numerous to count.

The Pre-Drilling Season Survey was originally scheduled to be conducted in early July but had to be substantially delayed due to the severe ice conditions on the Beaufort Sea and along the shoreline.

3. Results:

A total of 127 and 213 sightings of waste material were recorded during the Pre-Drilling Season Survey and Post-Drilling Season Survey, respectively. Greater than 90% of all waste material sighted in both surveys was presumed to have derived from Beaufort Sea oil and gas exploration activities. This was evident by the fact that dredge flotation collars (flotation collars from floating suction dredge pipelines), plastic pipes, scottsman buoys (round plastic inflatable buoys), and dredge floats were the predominant wastes sighted, all of which orignate primarily with the oil and gas industry.

The numbers of sightings recorded over twenty minute intervals and the sightings per minute for the two surveys are listed in Tables 1 and 2. Figures 4 and 5 indicate the distribution of the sighting frequencies for the two surveys. Areas with the highest sighting frequency included stretches of shoreline along the Tuktoyaktuk Peninsula, north of Atkinson Point, including zones of increased industrial activity such as McKinley Bay.

Eleven dead Beluga whales were sighted along the shoreline of the Western Portion of the Pre-Drilling Season Survey. The whales were presumed to have been killed during the annual Inuit whale hunt but not recovered. The locations of the dead whales were reported to Fisheries and Oceans Canada Officers in Inuvik, N.W.T.

Waste descriptions, numbers of items, and elapsed time for sightings during the Pre-Drilling Season Survey are detailed in Appendix 1.

Waste descriptions, numbers of items, and elapsed time for sightings during the Post-Drilling Season Survey are detailed in Appendix 2.

Table 1. Sighting Frequency Summary -

Nuvorak Point to Flagpole Point (Eastern Portion)

Time Period	Number of Sightings		Sightings Per Minute	
Minutes	Pre-Season	Post-Season	Pre-Season	Post-Season
00 - 20	18	28	0.90	1.40
20 - 40	30	44	1.50	2.20
40 - 60	15	9	0.75	0.45
60 - 80	13	15	0.65	0.75
80 - 100	1	2	0.05	0.10
Total	77	98		

Table 2. Sighting Frequency Summary -

Tent Point to Peninsula Point (Western Portion)

Time Period	Number of Sightings		Sightings Per Minute	
Minutes	Pre-Season	Post-Season	Pre-Season	Post-Season
00 - 20	5	7	0.25	0.35
20 - 40	5	10	0.25	0.50
40 - 60	16	26	0.80	1.30
60 - 80	5	23	0.25	1.15
80 - 100	4	5	0.20	0.25
100 - 120	4	19	0.20	0.95
120 - 140	6	17	0.30	0.85
140 - 160	5	8	0.25	0.40
Total	50	115		

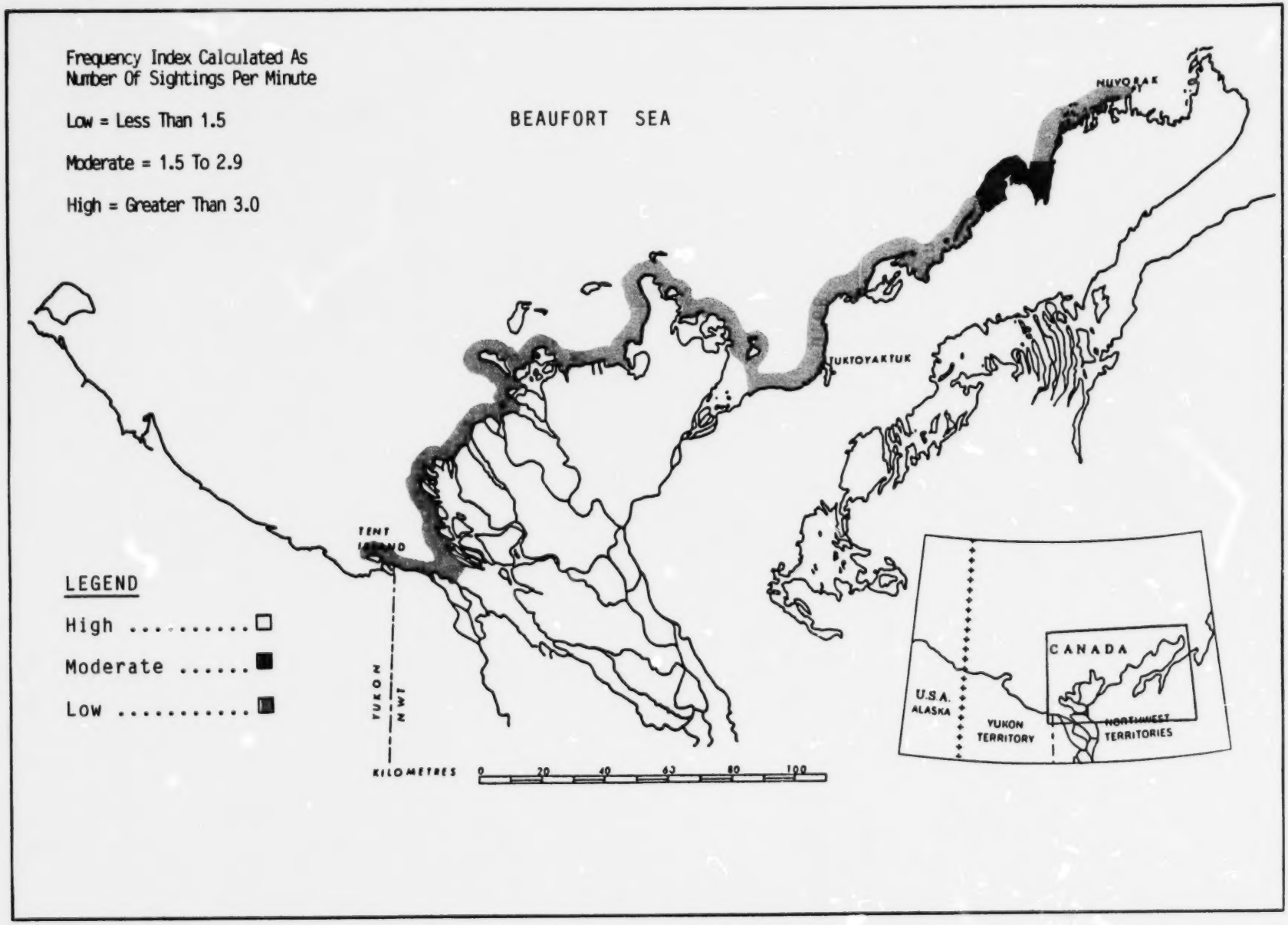

Figure 4: Map Showing Frequency of Sightings for the 1985 Pre-Drilling Season Survey.

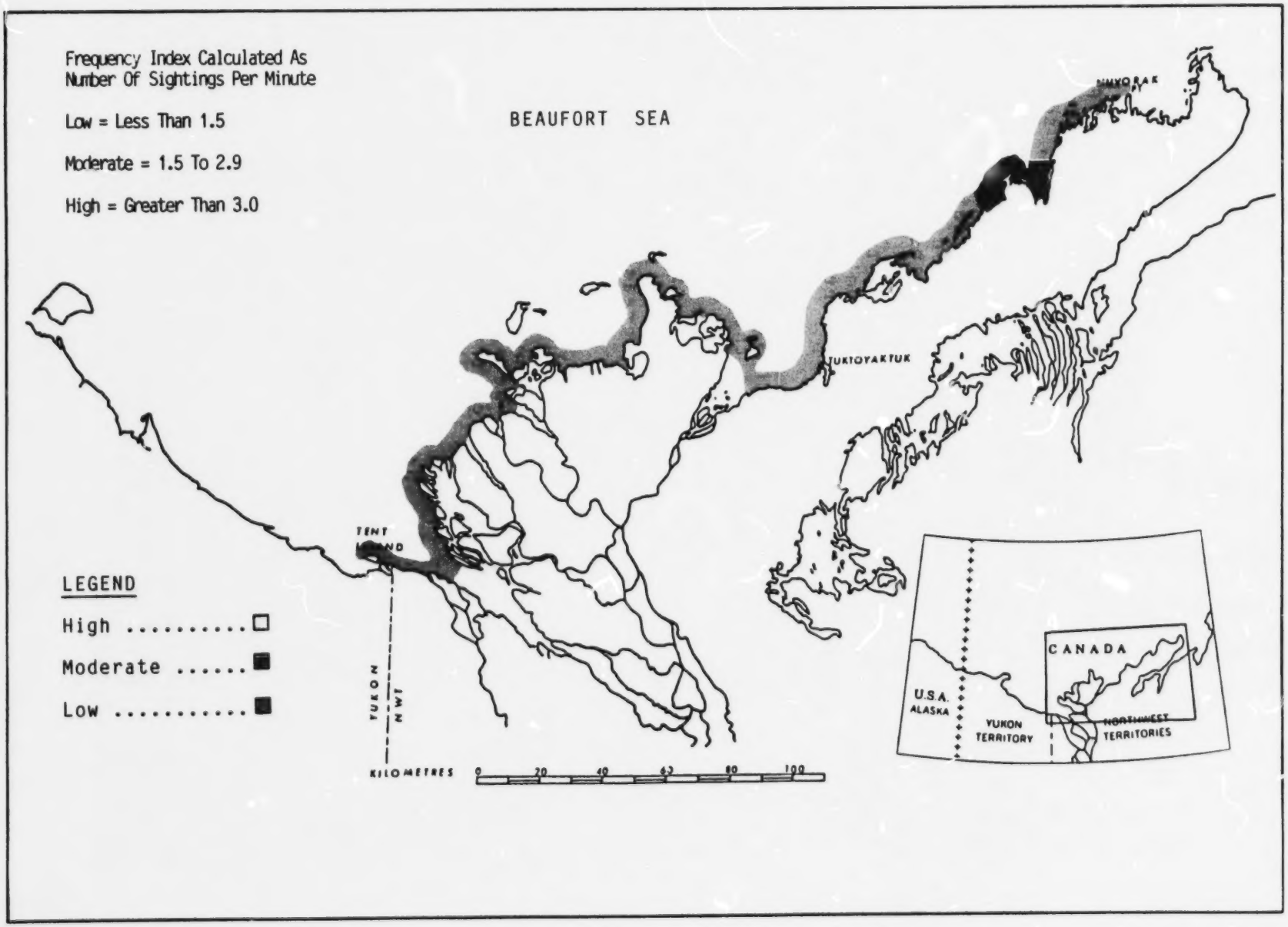

Figure 5: Map Showing Frequency of Sightings for the 1985 Post-Drilling Season Survey.

4. Discussion:

Drift wastes identified in 1985 were similar in type and source to those reported during the 1983 (Wainwright and Fenton, 1983) and 1984 (Shearer et al., 1985) surveys. The wastes most frequently sighted included dredge flotation collars, scottsman buoys, plastic pipes, and dredge floats, all of which were presumed to have derived from oil and gas exploration and development activities. Overall, the 1985 results support the conclusions of the two previous surveys that greater than 90% of all wastes sighted appeared to have originated with the oil and gas industry. Channel marker buoys were the items not associated with the oil and gas industry which were most frequently sighted. They were most likely transported to the study area by surface currents, either from inland areas along the Mackenzie River, or from the Yukon North Slope and Alaskan Beaufort Sea.

A total of 127 and 213 waste sightings were reported during the Pre-Drilling Season Survey and the Post-Drilling Season Survey, respectively. This represents a 68% increase in the total number of sightings in the Post-Drilling Season Survey compared to the sightings observed in the Pre-Drilling Season Survey. The total number of waste sightings in the Eastern and Western Portions of the two surveys increased by 27% and 130%, respectively.

The additional sightings observed in the Post-Drilling Season Survey can be attributed to the industrial activity that occurred between survey dates. The numerous offshore oil and gas exploration activities (including dredging and drilling operations, artificial island construction, and seismic and geotechnical surveys) that were undertaken during the summer of 1985 are illustrated in Figure 6. The higher sighting frequency reported for the McKinley Bay area (Eastern Portion of the survey) was likely due to the fact that McKinley Bay was the base of operations for Dome Petroleum Limited drillships and supply vessels, and a dry dock facility was also located there. All four drillships were in operation during the summer of 1985.

On the Western Portion of the shoreline surveys, the substantial increase in the total number of sightings in the Post-Drilling Season Survey can partially be attributed to the large dredging operations that were carried out to construct artificial islands at the Esso Resources Canada Adgo and Minuk wellsites, and the Chevron Canada Resources Ellice wellsite. These operations were undertaken only 5-12 km from the nearest shoreline and likely resulted in losses of materials. In addition, offshore oil and gas exploration activities at the

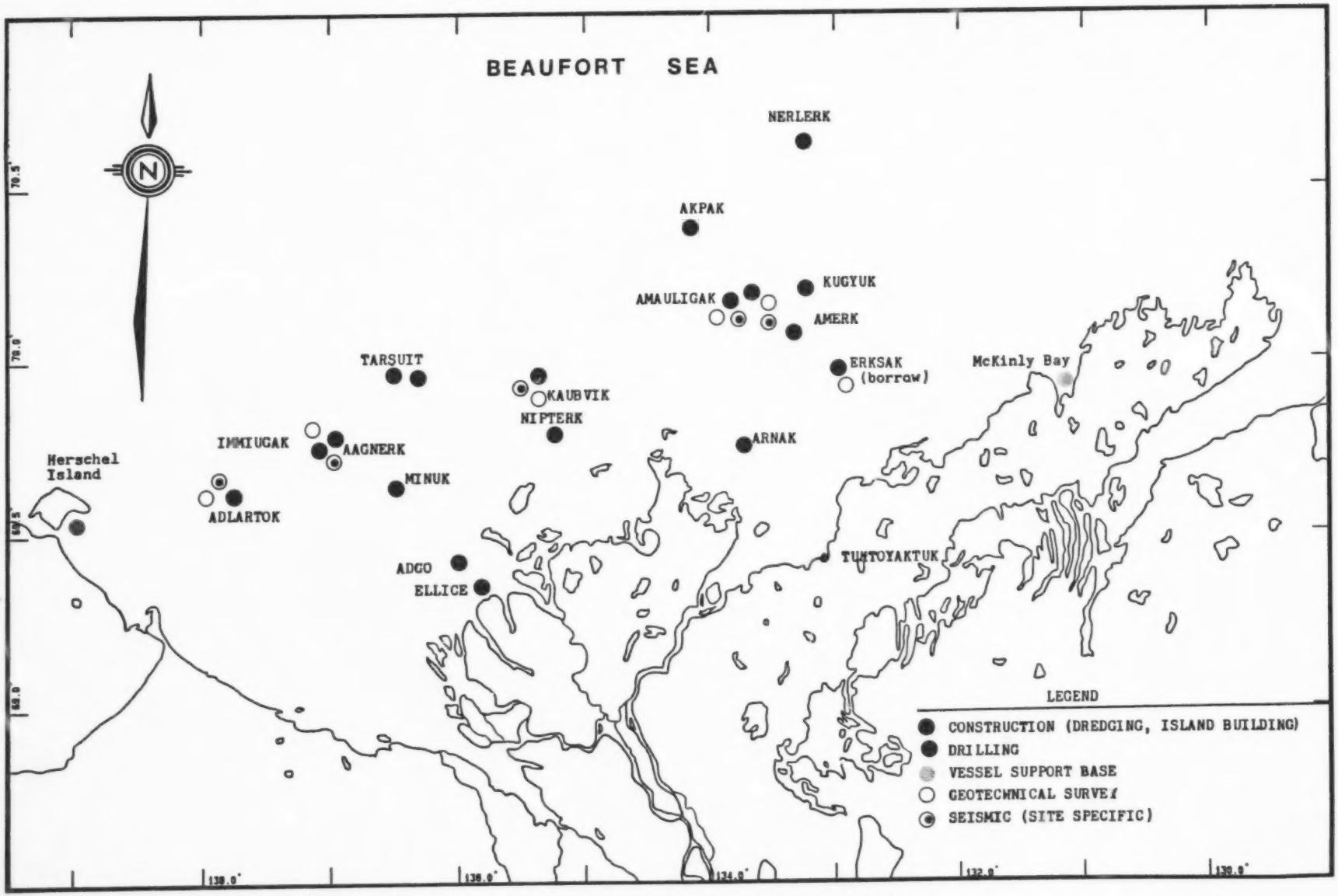

Figure: 6. MAP SHOWING OFFSHORE INDUSTRIAL ACTIVITIES DURING THE SUMMER OF 1985.

Gulf Canada Resources Amauligak, Akpak, Nerlerk (for Dome), Immiugak, Aagnerk, and Tarsiut wellsites; the Esso Resources Canada Kaubvik, Arnak, and Nipterk wellsites; and the Dome Petroleum Adlartok wellsite likely contributed to the increased occurrence of drift waste materials (Figure 6).

An historical summary of the 1983, 1984, and 1985 Beaufort Sea shoreline drift waste survey results over 12 timed (20 minute) intervals is presented in Figure 7. In reviewing Figure 7, it should be noted that a shoreline cleanup program was conducted by Dome and Esso in August, 1984. The cleanup program was effective, as indicated by the substantially lower sighting frequency in most cases during the Post-Cleanup Survey (September, 1984) as compared to the Pre-Cleanup Survey (July, 1984). In some areas, however, the cleanup program was not effective and in certain areas the frequency of waste sightings was higher during the Post-Cleanup survey. The apparent increase in wastes after cleanup was attributed to storm surges occurring between the two survey dates, lower tide levels during the second survey, and some waste material being overlooked by crew cleanup.

As indicated in Figures 4, 5, and 7, the frequency of waste sightings recorded during the two 1985 surveys was low. Only the McKinley Bay area had a frequency index of "moderate" over the two survey dates (Figures 4 and 5).

A shoreline cleanup program was carried out in August/September of 1986 by Esso Resources Canada Limited. The program involved collection of plastic wastes from Ellice Island to Warren Point (a stretch of shoreline which comprises most of the Western section of the EP drift waste survey). A post-cleanup survey was not conducted in 1986 to assess the effectiveness of this program.

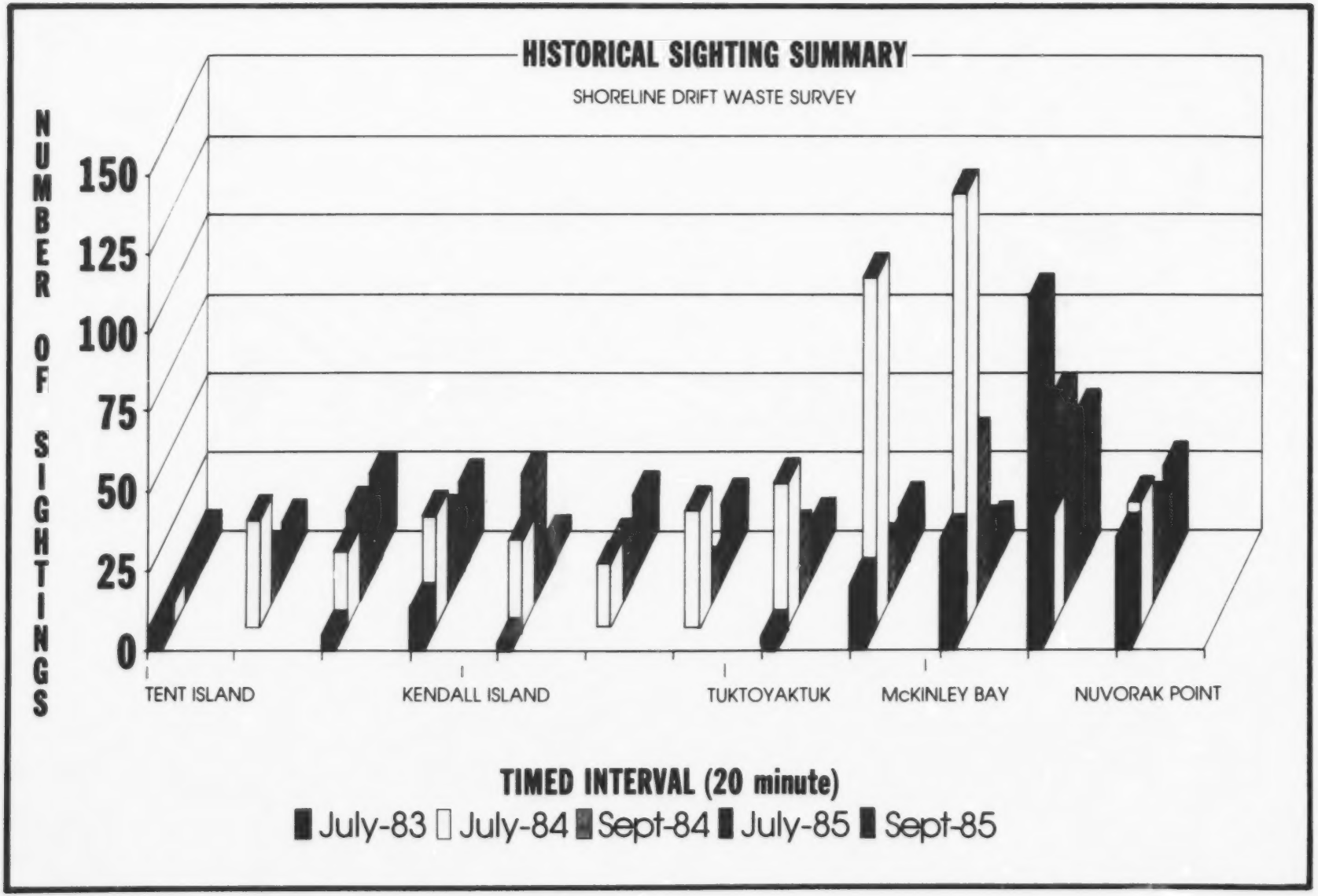

Figure: 7. SHORELINE DRIFT WASTE SURVEY, HISTORICAL SIGHTING SUMMARY 1983 - 1985.

5. Conclusions and Recommendations

1. The 1985 surveys results confirm the observations of Wainwright and Fenton (1983) and Shearer et al. (1985) that the drift wastes along the Beaufort Sea shoreline originate primarily with the oil and gas industry. It is recommended that industrial operators utilize good housekeeping practices while working offshore and control the loss of materials through the development and use of improved equipment that is better suited to withstand prevailing environmental conditions.

2. The concentrations of materials along the Beaufort Sea shoreline were lower in 1985 than before the 1984 cleanup. The highest concentrations of drift wastes were sighted in the McKinley Bay area (assigned a waste frequency index of "moderate").

3. It is recommended that a shoreline drift waste survey be conducted during the late spring-early summer of 1987 to assess the effectiveness of the cleanup program conducted in 1986 and to determine if a cleanup program is required during the summer of 1987.

4. It is recommended that the need for shoreline cleanup be reviewed annually and decisions to implement cleanup programs be contingent on the results of the previous shoreline survey.

5. It is recommended that industry be encouraged to adopt practices which prevent or reduce the occurrence of shoreline drift wastes. Provisions for shoreline cleanup should be included in offshore Environmental Operating Conditions (EOC's).

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APPENDIX I - Descriptions, Numbers, and Elapsed Time of Sightings of Waste Materials for the Pre-Drilling Season Survey.

BEAUFORT SEA - 1985 SHORELINE DRIFT WASTE SURVEY

PRE-DRILLING SEASON SURVEY

WESTERN PORTION - Peninsula Point to Tent Point

Starting Point: Peninsula Point, N.W.T. Time: 0:00

Waste Description	Number of Sightings	Elapsed Time of Sighting(hr:min:sec)
Orange Plastic	1	00:44
Floating Dredge Collar	1	02:00
Current Meter Bar	1	03:00
Orange Plastic	1	03:14
Orange Plastic	1	06:26
Position Reference:	3 mile Pingo	Time: 06:40
Position Reference:	East Whitefish Camp	Time: 08:39
Position Reference:	Hendrickson Island (South Point)	Time: 12:50
Damaged Aluminum Boat	1	16:00
Position Reference:	Racon Beacon (North Hendrickson Is.)	Time: 17:49
Floating Dredge Collar	1	19:48
Position Reference:	Hendrickson Island	Time: 21:30
Position Reference:	Kidluit Bay	Time: 23:44
White Plastic Pail	1	28:40
Orange Plastic	1	30:02
Current Meter Bar	1	30:59
Orange Steel Buoy	1	31:54
Scottsman Buoy	1	41:40
Position Reference:	Reindeer Island (South East Point)	Time: 44:43
Channel Marker Buoy	1	44:43

WasteDescription	Number of Sightings	Elapsed Time of Sighting(hr:min:sec)
TOUCH DOWN	-	**49:40 - 55:00**
Orange Plastic	1	55:41
Scottsman Buoy	1	55:41
Orange Plywood	1	59:00
Orange Plastic	1	1:00:04
Dredge Float	1	1:02:56
Insulation	1	1:03:38
Scottsman Buoy	1	1:19:40
Yellow Foam Pipe Insulation	1	1:24:05
Current Meter Bar	1	1:25:44
Position Reference:	Kendal Island (Old Camp)	Time: 1:27:09
Polyrope (Yellow)	1	1:30:06
Position Reference:	Gary Island (Southern Tip)	Time: 1:33:49
Floating Dredge Collar	1	1:35:05
Scottsman Buoy	1	1:38:55
Scottsman Buoy	1	1:41:04
Orange Plastic	1	1:41:45
Scottsman Buoy	1	1:44:31
Floating Dredge Collar	1	1:44:51
Current meter	1	1:47:42
Scottsman Buoy	1	1:51:47
Scottsman Buoy	1	1:52:35
Scottsman Buoy	1	1:52:35
Scottsman Buoy	1	1:55:23
Scottsman Buoy	1	1:55:23
Scottsman Buoy	1	1:55:59
Channel Marker	1	1:56:20
Floating Dredge Collar	1	1:57:08
Scottsman Buoy	1	1:57:08
Scottsman Buoy	1	1:57:21
Scottsman Buoy	1	2:08:57
Scottsman Buoy	1	2:09:18
Floating Dredge Collar	1	2:12:11
Scottsman Buoy	1	2:12:11
Channel Marker	1	2:14:30
Fuel Drum	1	2:17:53
Fuel Drum	1	2:20:10
Position Reference:	Shallow Bay (East Shore)	Time: 2:25:29

WasteDescription	Number of Sightings	Elapsed Time of Sighting(hr:min:sec)
Position Reference:	Shallow Bay (West Shore)	Time: 2:28:28
Orange Plastic	1	2:32:40
Scottsman Buoy	1	2:36:41
Metal Cannister	1	2:37:13
Position Reference:	Tent Point (End of Survey)	Time: 2:37:40

RETURNED TO TUKTOYAKTUK, N.W.T.

EASTERN PORTION - Flagpole Point to Nuvorak Point

Starting Point: Flagpole Point — Time: 00:00

Waste Description	Number of Sightings	Elapsed Time of Sighting(hr:min:sec)
Orange Pipe	1	3:58
Channel Marker Buoy	1	6:43
Metal Drum	1	7:05
Green Plastic	1	7:43
Orange Foam	1	8:18
Plastic Sheet	1	8:30
Black Plastic	1	9:03
Black Plastic	1	9:04
Poly Rope	1	9:09
Position Reference:	Toker Point	Time: 11:12
Plastic Pail	1	14:19
Black Plastic	1	18:38
Black Plastic	1	18:43
Channel Marker Buoy	1	19:46
Position Reference:	Warren Point	Time: 21:56
Channel Marker Buoy	1	22:25
Scottsman Buoy	1	30:20
Orange Plastic	1	31:41
Poly Rope	1	33:10
Dredge Collar	1	33:23
Metal Tank	1	33:31
Orange Float	1	33:48
Foam	1	34:41
Orange Plastic	1	36:30

Waste Description	Number of Sightings	Elapsed Time of Sighting(hr:min:sec)
Position Reference:	Bols Point	Time: 37:33
Scottsman Buoy	1	38:15
Orange Plastic	1	39:00
Floating Dredge Collar	1	39:07
Poly Rope	1	40:13
Dredge Collar	1	42:12
Foam	1	43:39
Pipe Insulation	1	43:59
Position Reference:	Drift Point	Time: 44:52
Orange Plastic	1	45:39
Floating Dredge Collar	1	45:55
Scottsman Buoy	1	46:35
Dredge Collars	2	46:43
Dredge Collar	2	47:25
Dredge Collar	1	48:28
Orange Plywood	1	48:50
Dredge Collar	2	49:02
Foam Insulation	1	49:02
Position Reference:	Atkinson Point	Time: 50:16
Dredge Floats	2	53:33
Dredge Collar	1	54:38
Plastic Pipe	1	55:11
Plastic Sheeting	1	56:03
Scottsman Buoy	1	59:58
Scottsman Buoy	1	1:00:13
Dredge Collar	1	1:00:23
Poly Rope	1	1:00:23
Dredge Float	1	1:01:27
Tire	1	1:01:50
Scottsman Buoy	1	1:01:57
Plastic Sheeting	1	1:02:13
Poly Rope	1	1:02:13
Orange Life Boat	1	1:02:44
Tire	1	1:03:30
Cannel Marker Buoy	1	1:03:59
Scottsman Buoy	1	1:04:33
Orange Plastic Box	1	1:07:16
Blue Poly Rope	1	1:08:00
Dredge Collar	1	1:08:56
Black Plastic	1	1:09:55
Plastic Sheeting	1	1:12:11

Waste Description	Number of Sightings	Elapsed Time of Sighting(hr:min:sec)
Scottsman Buoy	1	1:12:37
Poly Rope	1	1:12:37
Scottsman Buoy	1	1:12:45
White Plastic	1	1:14:33
Dredge Collar	1	1:15:13
Poly Rope	1	1:18:20
Wooden Spool	1	1:19:11
Scottsman Buoy	1	1:19:42
Dredge Collar	1	1:20:03
Plastic Sheeting	1	1:22:03
TOUCH DOWN	-	**1:22:33 - 1:27:32**
Yellow Rope	1	1:27:33
Scottsman Buoy	1	1:28:52
Orange Plastic	1	1:29:20
Position Reference:	Nuvorak Point (End of Survey)	Time: 1:29:29

RETURNED TO TUKTOYAKTUK, VIA CAPE DALHOUSIE AND NICHOLSON POINT

Total Elapsed Survey Time = 3:56:50

Total Number of Sightings = 127

APPENDIX II - Description, Numbers, and Elapsed Time of Sightings of Waste Materials for the Post-Drilling Season Survey

BEAUFORT SEA - 1985 SHORELINE DRIFT WASTE SURVEY

POST-DRILLING SEASON SURVEY

EASTERN PORTION - Nuvorak Point to Flagpole Point

Starting Point:Nuvorak, N.W.T. Time: 0:00

WasteDescription	Number of Sightings	Elapsed Time of Sighting(hr:min:sec)
Orange Plastic	1	1:49
Black Plastic	1	3:34
Orange Plastic	1	4:38
Scottsman Buoy	1	5:33
Green Plastic	1	6:03
Scottsman Buoy	1	6:28
Black Plastic	1	7:51
Channel Marker	1	8:04
Black Pipe	1	8:04
Orange Plastic	1	8:50
Scottsman Buoy	1	9:45
Orange Plastic	1	11:09
Dredge Collar	1	12:12
Orange Plastic	1	13:15
Orange Plastic	1	15:10
White Plastic	1	15:21
Yellow Plastic	1	15:28
Orange Plastic	1	15:40
Yellow Plastic	1	15:58
Orange Float	1	15:58
Poly Rope	1	15:58
Dredge Collar	1	16:18
Orange Plastic	1	16:36
Dredge Collar	1	19:00
Rubber Tire	1	19:42
Scottsman Buoy	1	20:00
Scottsman Buoy	1	21:19
Yellow Plastic	1	22:43
Position Reference:	McKinley Bay (Eastern Entrance)	Time: 22:43
Orange Plastic	1	23:31
Scottsman Buoy	1	23:44
Scottsman Buoy	1	23:57
Orange Plastic	1	24:08

WasteDescription	Number of Sightings	Elapsed Time of Sighting(hr:min:sec)
Dredge Collar	1	24:40
Black Plastic	1	24:54
Orange Plastic	1	25:04
Dredge Collar	1	25:18
5m Life Boat	1	25:42
Orange Plastic	1	26:00
Black Plastic	1	26:22
Scottsman Buoy	1	26:27
Rubber Tire	1	26:45
Dredge Float	1	26:56
Dredge Float	1	27:05
Yellow Rope	1	27:44
Dredge Collar	1	28:00
Yellow Rope	1	28:10
Scottsman Buoy	1	28:19
Orange Plastic	1	28:35
Life Ring	1	28:47
White Plastic	1	29:00
Yellow Plastic	1	29:10
Scottsman Buoy	1	30:23
White Plastic	1	30:59
Black Plastic	1	31:45
Orange Poly Rope	1	32:16
Scottsman Buoy	1	32:30
Dredge Collar	1	32:30
Yellow Rope	1	32:40
Dredge Collar	1	34:00
Poly Rope	1	34:00
Orange Plastic	1	34:23
Yellow Rope	1	34:23
Scottsman Buoy	1	34:31
Yellow Rope	1	34:39
White Plastic	1	35:06
Scottsman Buoy	1	35:22
Black Plastic	1	35:32
Black Plastic	1	37:50
Rubber Tire	1	37:58
Position Reference:	Atkinson Point (Racon)	Time: 40:29
Orange Plastic	1	41:25
Yellow Rope	1	43:40
Position Reference:	Drift Point	Time: 45:23

WasteDescription	Number of Sightings	Elapsed Time of Sighting(hr:min:sec)
Poly Rope	1	45:57
Dredge Collar	1	51:47
Position Reference:	Bols Point	Time: 53:31
Dredge Collar	1	55:01
Black Plastic	1	55:13
Black Plastic	1	55:51
White Plastic	1	56:54
Scrap Metal	1	57:53
Dredge Collar	1	57:54
Poly Rope	1	59:24
Scottsman Buoy	1	59:50
Black Plastic	1	1:07:50
White Plastic	1	1:08:49
Current Marker Buoy	1	1:09:07
Position Reference:	Warren Point (Beacon)	Time: 1:09:38
Black Plastic	1	1:10:12
White Plastic	1	1:10:20
Yellow Rope	1	1:10:20
Metal Buoy	1	1:12:02
Black Plastic	1	1:12:24
Position Reference:	Tuft Point	Time: 1:12:53
Black Plastic	1	1:15:08
White Plastic	1	1:17:45
Orange Plastic	1	1:18:56
Orange Plastic	1	1:19:50
Wooden Sign	1	1:22:18
White Plastic Pail	1	1:23:07
Position Reference:	Tibjak Point	Time: 1:24:03
Metal Pipe	1	1:24:03
Yellow Plastic	1	1:25:40
Position Reference:	Topkak Point	Time: 1:28:00
Rubber Tire	1	1:28:15
Position Reference:	Flagpole Point(End of Survey)	Time: 1:30:58

TOUCH DOWN AT TUKTOYAKTUK

WESTERN PORTION: Tent Point to Peninsula Point

Starting Point: Tent Point, Yukon — Time: 0:00

WasteDescription	Number of Sightings	Elapsed Time of Sighting(hr:min:sec)
Orange Foam	1	1:00
Dredge Collar	1	2:37
Yellow Foam	1	2:49
Plastic Pail	1	4:48
Orange Plastic	1	8:23
Yellow Foam	1	10:00
Yellow Foam	1	10:46
Position Reference:	Shallow Bay (Leave West Shore)	Time: 15:00
Position Reference:	Shallow Bay (Arrive East Shore)	Time: 18:20
Channel Marker Buoy	1	31:30
Scottsman Buoy	1	34:05
Dredge Collar	1	34:05
TOUCH DOWN	-	**34:05 - 35:00**
TOUCH DOWN	**View Grizzly Bear**	**36:00 - 38:24**
Channel Marker Buoy	1	40:51
Scottsman Buoy	1	41:23
TOUCH DOWN	-	**41:23 - 43:15**
Scottsman Buoy	1	44:14
Scottsman Buoy	1	47:18
Yellow Rope	1	47:18
White Float	1	49:20
TOUCH DOWN	-	**49:20 - 50:20**
Scottsman Buoy	1	51:19
Yellow Rope	1	58:14
Orange Foam	1	58:58
White Pail	1	59:20
Propane Tank	1	59:20
Dredge Collar	1	1:00:09
Yellow Foam	1	1:00:13
Current Meter Bar	1	1:01:05

WasteDescription	Number of Sightings	Elapsed Time of Sighting(hr:min:sec)
Position Reference:	Middle Channel (Leave West Shore)	Time: 1:07:32
Position Reference:	Middle Channel (East Shore)	Time: 1:09:10
Off Survey	Look at Upluk Drill Site	1:09:10 - 1:10:10
Green Plastic	1	1:13:27
Orange Plastic	1	1:14:00
Scottsman Buoy	1	1:14:30
TOUCH DOWN	-	**1:14:30 - 1:16:20**
Yellow Foam	1	1:17:05
Current Meter	1	1:17:49
Position Reference:	Old Drilling Platform (Gary P-04)	Time: 1:18:16
Fibre Glass Sheet	1	1:24:34
White Pail	1	1:24:34
Position Reference:	Gary Island (South Tip - West)	Time: 1:26:00
Dredge Collar	1	1:26:00
Scottsman Buoy	1	1:26:46
Yellow Rope	1	1:26:46
TOUCH DOWN	-	**1:26:46 - 1:28:46**
Black Plastic	1	1:29:30
Life Ring	1	1:32:38
Black Plastic	1	1:33:45
Yellow Rope	1	1:33:45
Black Plastic	1	1:34:00
Yellow Rope	1	1:34:33
Yellow Foam	1	1:35:20
Scottsman Buoy	1	1:35:42
White Plastic	1	1:37:06
Dredge Collar	1	1:37:14
Yellow Rope	1	1:37:36
Black Plastic	1	1:38:43
Black Plastic	1	1:39:47
Large Metal Box	1	1:40:27

WasteDescription	Number of Sightings	Elapsed Time of Sighting(hr:min:sec)
Black Plastic	1	1:40:40
Dredge Collar	1	1:41:05
Orange Plastic	1	1:43:03
Position Reference:	Gary Island (South Tip - East)	Time: 1:43:20
Black Plastic	1	1:44:50
Black Plastic	1	1:48:16
Position Reference:	Kendall Island (South Tip - East)	Time: 1:48:16
Orange Plastic	1	1:51:30
Black Plastic	1	1:51:30
Scrap Metal	1	1:51:30
Position Reference:	Kendall Island (Old Fish Camp)	Time: 1:53:06
Orange Plastic	1	1:53:20
Orange Boxes	2	1:57:40
Rubber Insulated Tank	1	1:57:41
Woooden Pallet	1	2:02:14
Orange Foam	1	2:02:53
Scottsman Buoy	1	2:03:15
Yellow Insulated Pipe	1	2:03:20
White Plastic	1	2:05:54
White Plastic	1	2:06:14
Dredge Collar	1	2:11:24
Black Anchor Buoy	1	2:18:39
Orange Ice Marker Buoy	1	2:19:09
Double Steel Tanks	1	2:21:25
Black Plastic	1	2:23:49
Scottsman Buoy	1	2:28:26
Blue Plastic Container	1	2:31:39
Black Plastic	1	2:32:14
Orange Plastic	1	2:32:14
Black Plastic	1	2:33:14
Dredge Collar	1	2:34:04
Dredge Collar	1	2:34:34
White Foam	1	2:34:34
White Plastic	1	2:35:15
Ice Marker Buoy	1	2:36:20
Yellow Plastic	1	2:36:27
Black Plastic	1	2:36:27

WasteDescription	Number of Sightings	Elapsed Time of Sighting(hr:min:sec)
Orange Plastic	1	2:36:27
White Plastic	1	2:37:16
Scottsman Buoy	1	2:41:12
White Plastic	1	2:47:05
White Plastic Barrel	1	2:48:15
Scottsman Buoy	1	2:51:15
Mooring Float	1	2:52:17
Ice Marker Buoy	1	2:53:11
Yellow and Red Electronic Device	1	2:53:59
Orange Plastic	1	2:54:18
TOUCH DOWN (Refuelling)	-	**2:54:18 - 3:08:40**
White Plastic	1	3:11:14
Black Plastic	1	3:11:41
Marker Pipe (Barber Pole)	1	3:12:16
Black Plastic	1	3:12:38
White Plastic	1	3:12:53
Orange Plastic	1	3:13:21
Position Reference: Kidluit Bay		Time: 3:15:20
Position Reference: Hendrickson Island (South Point)		Time: 3:17:49
Black Plastic	1	3:18:46
White Plastic	1	3:18:55
Dredge Collar	1	3:19:50
White Plastic	1	3:22:26
White Plastic	1	3:23:36
Damaged Alum. Boat	1	3:24:20
White Plastic	1	3:25:22
Yellow Plastic	1	3:27:40
Position Reference: Hendrickson Island (Leave South Point)		Time: 3:27:40
Position Reference: East Whitefish Camp		Time: 3:32:36
Orange Plastic	1	3:34:39
Yellow Foam	1	3:35:35
Orange Plastic	1	3:35:57
Ice Marker Buoy	1	3:39:20
Dredge Collar	1	3:39:47
Current Meter Bar	1	3:39:47

Waste Description	Number of Sightings	Elapsed Time of Sighting
Orange Plastic	1	3:40:40
Yellow Rope	1	3:41:06
Position Reference:	Peninsula Point (End of Survey)	Time: 3:42:58

TOUCHED DOWN AT TUKTOYAKTUK

Total Elapsed Survey Time = 4:48:33

Total Number of Sightings = 213